

1 CLAIMS

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3 1. A method comprising:
4 generating an edge map from scanned image data; and
5 analyzing the edge map to determine a plurality of boundaries; and
6 evaluating the boundaries based on a set of rules to identify a plurality of
7 objects.

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9 2. A method as recited in claim 1, wherein the analyzing further
10 comprises taking a Hough transform of the scanned image to determine the
11 boundaries.

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13 3. A method as recited in claim 1, wherein a first object of the objects is
14 aligned with respect to another object of the objects.

15
16 4. A method as recited in claim 1, wherein at least one subset of the
17 objects are rectangular in shape.

18
19 5. A method as recited in claim 1, wherein at least one subset of the
20 plurality of objects are photographs.

21
22 6. A computer readable medium comprising computer-executable
23 instructions to perform a method as recited in claim 1.
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1 7. A method for detecting one or more objects in image data, the
2 method comprising:

3 generating an edge map from the image data; and

4 analyzing the edge map to determine a plurality of boundaries of the one or
5 more objects.

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7 8. A method as recited in claim 7, wherein the one or more objects are
8 photographs.

9
10 9. A method as recited in claim 7, wherein the one or more objects are
11 rectangular in shape.

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13 10. A method as recited in claim 7, further comprising segmenting the
14 one or more objects based on the set of boundaries.

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16 11. A method as recited in claim 7, wherein the edge map comprises an
17 array of elements, each element representing a respective pixel of the image data;
18 and

19 wherein the generating further comprises:

20 estimating a background color of a scanner lid;

21 for each pixel of at least one subset of the image data:

22 identifying an absolute difference between a value of a
23 current pixel and the background color; and
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25

1 if the absolute difference is greater than a predetermined
2 threshold, indicating that a corresponding array element represents a pixel of the
3 at least one subset of image data that belongs to an edge.

4
5 **12.** A method as recited in claim 7:

6 wherein the edge map comprises an array of elements, each element
7 representing a respective pixel of the image data;

8 wherein the analyzing further comprises:

9 transforming the array of elements to produce a set of domain peaks,
10 each domain peak corresponding to a straight line of a set of straight lines; and

11 determining which of the straight lines belong to the
12 set of boundaries based on a set of rules.

13
14 **13.** A method as recited in claim 12, wherein the determining further
15 comprises:

16 identifying a boundary set that indicates an object at a distinct angle
17 as compared to an orientation of a previously found object;

18 identifying a boundary set that indicates an object having a same
19 dimension as a previously found object; and

20 identifying pairs of parallel and perpendicular boundaries that
21 indicate an object that satisfies a substantially non-background interior condition
22 with a previously found object.

1 **14.** A method as recited in claim 12:
2 wherein the edge map comprises an array of elements, each element
3 representing a respective pixel of the image data; and
4 wherein the transforming further comprises taking a Hough transform of
5 the array of elements to produce the set of domain peaks.

6
7 **15.** A method as recited in claim 7:
8 wherein the edge map comprises an array of elements, each element
9 representing a respective pixel of the image data;
10 wherein the analyzing further comprises:
11 transforming the array elements to produce a set of domain peaks,
12 each domain peak corresponding to a straight line of a set of straight lines; and
13 determining which of the straight lines belong to the set of
14 boundaries based on a set of rules, the set of rules comprising rules that are
15 directed to:
16 identifying a first object with a first dimension; and
17 seeking a same sized object with a second dimension that
18 corresponds to the first dimension

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20 **16.** A method as recited by claim 15, wherein the identifying comprises:
21 determining a background color;
22 determining a candidate object; and
23 if an interior portion of the candidate object is not consistent with the
24 background color, concluding that the candidate object is the first object.
25

1 **17.** A method as recited in claim 15, wherein a line of the straight lines
2 corresponds to a candidate object, the seeking further comprising:

3 detecting a first image to background transition that corresponds to the first
4 image, and a second image to background transition that corresponds to the line;
5 and

6 if the first image to background transition does not coincide with the second
7 image to background transition, assigning the line to be a boundary of a different
8 object.

9
10 **18.** A computer readable medium comprising a computer program
11 configured to perform a method as recited in claim 1.

12
13 **19.** A method for detecting whether image data represents more than
14 one object, the method comprising:

15 determining a background color of a scanner lid;

16 identifying a set of transitions between the background color and other
17 colors that correspond to the image data; and

18 analyzing the set of transitions to detect a set of image data characteristics;

19 estimating based on a set of one or more rules, a number of objects based
20 on the set of image data characteristics.

21
22 **20.** A method as recited in claim 19, wherein the objects are rectangular
23 in shape.

1 **21.** A method as recited in claim 19, wherein the image data is scanned
2 preview image data.

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4 **22.** A method as recited in claim 19, wherein the analyzing further
5 comprises taking a Hough transform of the set of transitions to detect the set of
6 image data characteristics.

7
8 **23.** A method as recited in claim 19, further comprising:
9 calculating a set of boundaries that delineate the objects based on the set of
10 image data characteristics; and
11 segmenting the objects from the image data based on the set of boundaries.

12
13 **24.** A method as recited in claim 19, wherein the identifying further
14 comprises:

15 for each row(i) of image data:

16 calculating a left(i) transition from background data to image data;

17 calculating a right(i) transition from image data to background data;

18 determining a difference(i) between right(i) transition and left(i)

19 transition;

20 for each column(j) of image data:

21 calculating a top(j) transition from background data to image data;

22 calculating a bottom(j) transition from image data to background

23 data;

24 determine a difference(j) between bottom(j) transition and top(j)

25 transition;

1 generating a first histogram from each difference(i);
2 generating a second histogram from each difference(j); and
3 using a set of characteristics that are displayed by the first and second
4 histograms display to determine whether the image data represents one objects or
5 more than one object.

6
7 **25.** A method as recited in claim 19, further comprising:

8 generating a first histogram representing horizontal transitions from the
9 transitions;

10 generating a second histogram representing vertical transitions from the
11 transitions;

12 the first and second histograms displaying a set of peaks that identify
13 whether the image data comprises more than one object; and

14 the set of rules comprising the following rules:

15 (a) if the set of peaks comprises only a single peak, classifying the
16 image data as containing only a single object;

17 (b) if the set of peaks comprises only two peaks, classifying the
18 image data as containing multiple objects;

19 (c) classifying the image data as comprising multiple objects if there
20 is a gap in either the first histogram or the second histogram; and

21 (d) if neither (a), (b), or (c) apply, classifying the image data as
22 comprising multiple objects.

1 **26.** One or more computer-readable media containing a computer
2 executable program that performs a method as recited in claim 19.

3
4 **27.** A device for detecting multiple objects in image data, the device
5 comprising:

6 a processor configured to execute computer program instructions for:

7 generating an edge map from the image data;

8 analyzing the edge map to determine a set of boundaries of the one
9 or more objects; and

10 segmenting the one or more objects based on the set of boundaries.

11
12 **28.** A device as recited in claim 27, wherein the analyzing further
13 comprises taking a Hough transform of the edge map to determine the set of
14 boundaries.

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16 **29.** A device as recited in claim 27, wherein the analyzing further
17 comprises:

18 determining a set of transitions between the set of boundaries and a
19 background color;

20 identifying a set of characteristics from the set of transitions, the set of
21 characteristics being used to indicate whether the image data comprises a single
22 object or whether the image data comprises a plurality of objects; and

23 if the image data corresponds to a plurality of objects, assigning particular
24 ones of the set of boundaries to particular ones of the plurality of objects based
25 on a set of rules.

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2 **30.** A device as recited in claim 29, wherein the set of rules comprises
3 rules that are directed to:

4 determining a background color of a scanner lid;

5 determining a candidate object;

6 determining that the candidate object is a first object, the first object
7 having a first dimension if an interior portion of the candidate object is not
8 consistent with the background color; and

9 seeking a same sized object with a second dimension that
10 corresponds to the first dimension.
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12 **31.** A device as recited in claim 29, wherein the set of rules comprises
13 rules that are directed to:

14 determining a background color of a scanner lid;

15 determining a first candidate object;

16 if an interior portion of the first candidate object is not consistent
17 with the background color, determining that the first candidate object is a first
18 object, the first object having a first dimension; and

19 seeking a same sized object with a second dimension that
20 corresponds to the first dimension, the seeking comprising:

21 identifying a boundary of the set of boundaries that
22 corresponds to a second candidate object;

23 detecting a first image to background transition that
24 corresponds to the first object, and a second image to background transition that
25 corresponds to the boundary; and

1 if the first image to background transition does not coincide with the second
2 image to background transition, assigning the boundary to the same sized object.

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4 **32.** A device as recited in claim 29, wherein the identifying further
5 comprises:

6 for each row(i) of image data:

7 calculating a left(i) transition from background data to image data;

8 calculating a right(i) transition from image data to background data;

9 determine a difference(i) between right(i) transition and left(i)
10 transition;

11 for each column(j) of image data:

12 calculating a top(j) transition from background data to image data;

13 calculating a bottom(j) transition from image data to background
14 data;

15 determine a difference(j) between bottom(j) transition and top(i)
16 transition;

17 generating a first histogram from each difference(i);

18 generating a second histogram from each difference(j); and

19 wherein the first and second histograms display the set of characteristics.
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1 **33.** A device as recited in claim 29, wherein the set of rules is a first set
2 of rules, and wherein the set of characteristics indicate a set of peaks that are used
3 to identify whether the image data comprises a single object or a plurality of
4 objects based on a second set of rules, the second set of rules comprising rules that
5 are directed to:

6 (a) if the set of peaks comprises only a single peak, classifying the
7 image data as containing only a single object;

8 (b) if the set of peaks comprises only two peaks, classifying the
9 image data as containing a plurality of objects;

10 (c) if there is a gap in either the first histogram or the second
11 histogram, then classifying the image data as comprising containing a
12 plurality of objects; and

13 (d) if neither (a), (b), or (c) apply, classifying the image data as
14 comprising containing a plurality of objects.

15
16 **34.** A computer readable storage medium comprising a program module
17 for detecting multiple objects in image data, wherein the program module
18 performs acts comprising:

19 generating an edge map from the image data; and

20 analyzing the edge map to determine a set of boundaries of the one or more
21 objects.

22
23 **35.** A computer readable storage medium as recited in claim 34,
24 wherein the one or more objects are photographs.

1 **36.** A computer readable storage medium as recited in claim 34,
2 wherein the one or more objects are rectangular in shape.

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4 **37.** A computer readable storage medium as recited in claim 34,
5 wherein the program module further performs acts comprising segmenting the one
6 or more objects based on the set of boundaries.

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8 **38.** A computer readable storage medium as recited in claim 34,
9 wherein the edge map comprises an array of elements, each element representing a
10 respective pixel of the image data; and

11 wherein the generating further comprises:

12 estimating a background color of a scanner lid;

13 for each pixel of the image data:

14 identifying an absolute difference between a value of the
15 pixel and the background color; and

16 if the absolute difference is greater than a predetermined
17 threshold, indicating that a corresponding array element represents a pixel of the
18 image data that belongs to an edge.

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20 **39.** A computer readable storage medium as recited in claim 34,
21 wherein the analyzing further comprises:

22 transforming the array elements to produce a set of domain peaks, each
23 domain peak corresponding to a straight line of a set of straight lines; and

24 determining which of the straight lines belong to the set of boundaries
25 based on a set of rules.

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2 **40.** A computer readable storage medium as recited in claim 39,
3 wherein the transforming further comprises taking a Hough transform of the array
4 of elements to produce the set of domain peaks.

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6 **41.** A computer readable storage medium as recited in claim 34,
7 wherein the analyzing further comprises:

8 transforming the array elements to produce a set of domain peaks, each
9 domain peak corresponding to a straight line of a set of straight lines; and

10 determining which of the straight lines belong to the set of boundaries
11 based on a set of rules, the set of rules comprising rules that are directed to:

12 identifying a first object with a first dimension; and

13 seeking a same sized object with a second dimension that
14 corresponds to the first dimension.

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16 **42.** A computer readable storage medium as recited in claim 41,
17 wherein the identifying comprises:

18 determining a background color of a scanner lid;

19 determining a candidate object; and

20 if an interior portion of the candidate object is not consistent with the
21 background color, concluding that the candidate object is the first object.

1 **43.** A computer readable storage medium as recited in claim 41,
2 wherein a line of the straight lines corresponds to a candidate object, the seeking
3 further comprising:

4 detecting a first image to background transition that corresponds to the first
5 image, and a second image to background transition that corresponds to the line;
6 and

7 if the first image to background transition does not coincide with the second
8 image to background transition, assigning the line to be a boundary of a different
9 object.

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11 **44.** A computer comprising one or more computer-readable media as
12 recited in claim 34.
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